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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/572,524	09/11/2007	Xuejun Kang	7989P001	4739

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EXAMINER
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JOY, JEREMY J

ART UNIT	PAPER NUMBER
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2822

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/572,524	<b>Applicant(s)</b> KANG ET AL.	
	<b>Examiner</b> Jeremy J. Joy	<b>Art Unit</b> 2822	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 December 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6, 9-10, 12, 14-16, 18-21, 23-28, 29-36, 38-48, 50-51 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 29-36, 38-46, 50 and 51 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-6, 9-10, 12, 14-16, 18-21, 23-28, and 47-48 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> .                                  | 6) <input type="checkbox"/> Other: _____                          |

Continuation of 3): 04/20/2007, 04/29/2008, 04/29/2008, 07/02/2008, 03/25/2009, 05/22/2009, 12/14/2009, and 01/06/2010.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of group II, claims 29-36, 38-46 and 50-51 in the reply filed on 12/14/2009 is acknowledged. Claims 1-6, 9-10, 12, 14-16, 18-21, 23-28 and 47-48 have been withdrawn. Claims 7-8, 11, 13, 17, 22, 37 and 49 have been previously cancelled. Action on the merits is as follows:

### ***Specification***

2. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### ***Claim Objections***

3. Claim **44** recites the limitation "the second ohmic contact layer" in lines 1-2. There is insufficient antecedent basis for this limitation. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims **31, 34 and 38-39** are rejected under 35 U.S.C. 102(e) as being anticipated by *Lee et al.* (**U.S. Patent Pub. No. 2003/0189215**, from hereinafter "*Lee*").

**Regarding Claim 31**, *Lee* teaches a device comprising epitaxial layers, a first ohmic contact layer on a first surface of the epitaxial layers, a relatively thick layer of a thermally conductive metal on the first ohmic contact layer, and a second ohmic contact layer on a second surface of the epitaxial layers (Fig. 15, epitaxial layers 124/126/128, first ohmic contact 150, thick layer 156, second ohmic contact 160; ¶ 0031-0050).

Furthermore, the following limitation: "the relatively thick layer being applied by electroplating" is a method limitation in a device claim. The method of forming a device is not germane to the patentability of the device itself. Therefore this limitation has not been given patentable weight. The MPEP § 2113, states, "Even though product by process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985)(citations omitted).

**Regarding Claim 34**, *Lee* discloses the relatively thick layer is at least 50µm (¶ 0041).

**Regarding Claim 38**, *Lee* discloses the thermally conductive metal is copper and the epitaxial layers comprise multiple GaN-related epitaxial layers (§ 0032 and 0041).

**Regarding Claim 39**, *Lee* discloses the device is a light emitting diode (§ 0029).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims **29-30, 32-33 and 50-51** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Lee* in view of *Anderson et al.* (**U.S. Patent No. 5,811,927 B2**, from hereinafter "*Anderson*").

**Regarding Claims 29**, *Lee* teaches a light emitting diode having multiple epitaxial layers and a first ohmic contact layer on the epitaxial layers; a suitable metal coated on the first ohmic contact layer and a relatively thick layer of thermally conductive metal on the epitaxial layer, but fails to specifically teach the suitable metal is a seed layer formed of the thermally conductive metal (Fig. 15, epitaxial layers 124/126/128, first ohmic contact 150, thick layer 156; § 0031-0050).

*Anderson* teaches depositing a thermally conductive material on a seed layer of the same material which is formed on a device layer for metal-to-metal bonds similar to that of the applicants described invention (Col. 4 - Col. 5, lines 8-23).

In view of the teachings of *Anderson*, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the teachings of *Lee* to include a seed layer formed on the first ohmic contact of the thermally conductive material because the seed layer helps with adhesion of the relatively thick layer to the ohmic electrode and also facilitates proper formation of the relatively thick layer during a formation process requiring electrodeposition. Furthermore, with regards to the method limitations in the present claim, the examiner would like to point out that the method of making the device is not germane to the patentability of the device itself. Therefore these limitations have not been given patentable weight. The MPEP § 2113, states, "Even though product by process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985)(citations omitted).

**Regarding Claim 30**, *Lee* teaches a laser diode having multiple epitaxial layers and a first ohmic contact layer on the epitaxial layers; a suitable metal coated on the first ohmic contact layer and a relatively thick layer of thermally conductive metal on the epitaxial layer, but fails to specifically teach the suitable metal is a seed layer formed of the thermally conductive metal (Fig. 15, epitaxial layers 124/126/128, first ohmic contact 150, thick layer 156; ¶ 0031-0050 also see ¶ 0017).

*Anderson* teaches depositing a thermally conductive material on a seed layer of the same material which is formed on a device layer for metal-to-metal bonds similar to that of the applicants described invention (Col. 4 - Col. 5, lines 8-23).

In view of the teachings of *Anderson*, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the teachings of *Lee* to include a seed layer formed on the first ohmic contact of the thermally conductive material because the seed layer helps with adhesion of the relatively thick layer to the ohmic electrode and also facilitates proper formation of the relatively thick layer during a formation process requiring electrodeposition. Furthermore, with regards to the method limitations in the present claim, the examiner would like to point out that the method of making the device is not germane to the patentability of the device itself. Therefore these limitations have not been given patentable weight. The MPEP § 2113, states, "Even though product by process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985)(citations omitted).

**Regarding Claims 32-33**, *Lee* above fails to specifically teach an adhesive layer on the first ohmic contact layer between the first ohmic contact layer and the relatively thick layer and more specifically a seed layer of the thermally conductive material



between the adhesive layer and the relatively thick layer but does teach a suitable metal coated on the first ohmic contact layer between the relatively thick layer.

*Anderson* however teaches a thermally conductive material formed on a seed layer of the same material which is formed on an adhesive layer that is formed on a device layer for metal-to-metal bonds similar to that of the applicants described invention (Col. 4 - Col. 5, lines 8-23).

In view of the teachings of *Anderson*, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the teachings of *Lee* to include an adhesive layer formed on the first ohmic contact layer and a seed layer formed on the adhesive layer made of the thermally conductive material because the seed layer and the adhesive layer helps to strengthen and ensure the metal-to-metal bond of the ohmic contact layer and the relatively thick layer. Furthermore, the seed layer also facilitates proper formation of the relatively thick layer during a formation process requiring electrodeposition.

**Regarding Claim 50**, *Lee* teaches a light emitting device having multiple epitaxial layers and a first ohmic contact layer on the epitaxial layers; a suitable metal coated on the first ohmic contact layer and a relatively thick layer of thermally conductive metal on the epitaxial layer, but fails to specifically teach the suitable metal is a seed layer formed of the thermally conductive metal (Fig. 15, epitaxial layers 124/126/128, first ohmic contact 150, thick layer 156; ¶ 0031-0050).

*Anderson* teaches depositing a thermally conductive material on a seed layer of the same material which is formed on a device layer for metal-to-metal bonds similar to that of the applicants described invention (Col. 4 - Col. 5, lines 8-23).

In view of the teachings of *Anderson*, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the teachings of *Lee* to include a seed layer formed on the first ohmic contact of the thermally conductive material because the seed layer helps with adhesion of the relatively thick layer to the ohmic electrode and also facilitates proper formation of the relatively thick layer during a formation process requiring electrodeposition. Furthermore, with regards to the method limitations in the present claim, the examiner would like to point out that the method of making the device is not germane to the patentability of the device itself. Therefore these limitations have not been given patentable weight. The MPEP § 2113, states, "Even though product by process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985)(citations omitted).

**Regarding Claim 51**, *Lee* discloses the device is a light emitting diode (¶ 0029).

6. Claims **35-36** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Lee*.

**Regarding Claim 35**, although *Lee* fails to teach the size of the ohmic contact layers, *Lee* does teach the ohmic contact layer as claimed and discloses the size of the relatively thick layer providing a scale at which the claimed range would fall in when forming a thinner ohmic contact layer. In view of the teachings of *Lee* and with ordinary skill in the art at the time of the invention it would have been obvious to include that the ohmic electrode could be formed to be in the range of 3 to 500 nm because the ohmic electrodes should be formed small enough so that they don't increase the resistance in the device but large enough, so that they provide a strong electrical contact to the epitaxial layers. Furthermore, the applicant has not established the critical nature of this range. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). Therefore, it would have been obvious to one having ordinary

**Regarding Claim 36**, although, *Lee* above fails to specifically teach the second ohmic contact layer is selected from a group consisting of: opaque, transparent, and semi-transparent, and includes bonding pads, *Lee* does teach in a separate embodiment an ohmic contact layer selected from a group consisting of: opaque, transparent, and semi-transparent, and includes bonding pads (Fig. 1, ohmic contact layer 32, bonding pads 34/36; ¶ 0012). In view of the teachings of *Lee* and with ordinary skill in the art at the time of the invention it would have been obvious to include the

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second ohmic contact layer is selected from a group consisting of: opaque, transparent, and semi-transparent, and includes bonding pads because these properties of a ohmic contact layer will help improve the light emission of the device and the bonding pads will help provide strong electrical contact to the ohmic layer and to the rest of the device.

7. Claims **40** is rejected under 35 U.S.C. 103(a) as being unpatentable over *Lee* above, and further in view of *Chen et al.* (**U.S. Patent No. 6,319,778 B1**, from hereinafter "*Chen*").

**Regarding Claim 40**, *Lee* above, fails to teach the first ohmic contact layer, at its interface with the epitaxial layers, is a mirror.

*Chen* however teaches a light emitting device similar to that of the applicant and *Lee* above wherein the first ohmic contact layer, at its interface with the epitaxial layers, is a mirror (Fig. 3, first ohmic contact layer 30, epitaxial layers 10-16; Col. 3, lines 26-40).

In view of the teachings of *Chen*, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the teachings of *Lee*, as modified by *Anderson* above to include that at it's interface with the epitaxial layers the first ohmic contact layer is a mirror because this would help avoid "light absorption by the substrate and the decreasing of luminous intensity of the emitting light." (*Chen*).

8. Claims **41-46** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Lee* in view of *Anderson* and further in view of *Chen*.

**Regarding Claim 41**, *Lee* teaches a light emitting device comprising epitaxial layers, a first ohmic contact layer on a first surface of the epitaxial layers and a relatively thick layer of thermally conductive metal formed on the epitaxial layers (Fig. 15, epitaxial layers 124/126/128, first ohmic contact 150, thick layer 156; ¶ 0031-0050 also see ¶ 0017).

*Lee* fails to teach an adhesive layer and a seed layer formed between the first ohmic contact layer and the relatively thick layer but does teach a suitable metal coated on the first ohmic contact layer but between the relatively thick layer.

*Anderson* however teaches a thermally conductive material formed on a seed layer of the same material which is formed on an adhesive layer that is formed on a device layer for metal-to-metal bonds similar to that of the applicants described invention (Col. 4 - Col. 5, lines 8-23).

In view of the teachings of *Anderson*, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the teachings of *Lee* to include an adhesive layer formed on the first ohmic contact layer and a seed layer formed on the adhesive layer made of the thermally conductive material because the seed layer and the adhesive layer helps to strengthen and ensure the metal-to-metal bond of the ohmic contact layer and the relatively thick layer. Furthermore, the seed layer also facilitates proper formation of the relatively thick layer during a formation process requiring electrodeposition.

*Lee*, as modified by *Anderson* above, fails to teach the first ohmic contact layer, at its interface with the epitaxial layers, is a mirror.

*Chen* however teaches a light emitting device similar to that of the applicant and *Lee* above wherein the first ohmic contact layer, at its interface with the epitaxial layers, is a mirror (Fig. 3, first ohmic contact layer 30, epitaxial layers 10-16; Col. 3, lines 26-40).

In view of the teachings of *Chen*, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the teachings of *Lee*, as modified by *Anderson* above to include that at its interface with the epitaxial layers the first ohmic contact layer is a mirror because this would help avoid "light absorption by the substrate and the decreasing of luminous intensity of the emitting light." (*Chen*).

**Regarding Claim 42**, *Lee* teaches the relatively thick layer is one or more selected from the group consisting of a heat sink, an electrically connector, and a mechanical support (§ 0041).

**Regarding Claim 43**, *Lee* teaches a second ohmic contact layer on a second surface of the epitaxial layers (Fig. 12, ohmic electrodes 160; § 0046), but fails to teach the size of the ohmic contact layers. In view of the teachings of *Lee* and with ordinary skill in the art at the time of the invention it would have been obvious to include that the ohmic electrodes could be formed to be in the range of 3 to 500 nm because the ohmic electrodes should be formed small enough so that they don't increase the resistance in the device but large enough, so that they provide a strong electrical contact to the epitaxial layers. Furthermore, the applicant has not established the critical nature of this range. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such

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a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have various ranges.

**Regarding Claim 44**, although, *Lee* above fails to specifically teach the second ohmic contact layer is selected from a group consisting of: opaque, transparent, and semi-transparent, *Lee* does teach in a separate embodiment an ohmic contact layer selected from a group consisting of: opaque, transparent, and semi-transparent (Fig. 1, ohmic contact layer 32, bonding pads 34/36; ¶ 0012). In view of the teachings of *Lee* and with ordinary skill in the art at the time of the invention it would have been obvious to include the second ohmic contact layer is selected from a group consisting of: opaque, transparent, and semi-transparent because these properties of a ohmic contact layer will help improve the light emission of the device as the light will often be emitted from the active layer towards the second ohmic contact layer.

**Regarding Claim 45**, *Lee* discloses the thermally conductive metal is copper and the epitaxial layers comprise multiple GaN-related epitaxial layers (¶ 0032 and 0041).

**Regarding Claim 46**, *Lee* discloses the device is a light emitting diode (¶ 0029).

### ***Conclusion***

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeremy J. Joy whose telephone number is (571)270-7445. The examiner can normally be reached on Monday - Friday, 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571)-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jeremy J. Joy/  
Examiner, Art Unit 2822  
March 31, 2010

/Kiesha R. Bryant/  
Supervisory Patent Examiner, Art Unit 2891